

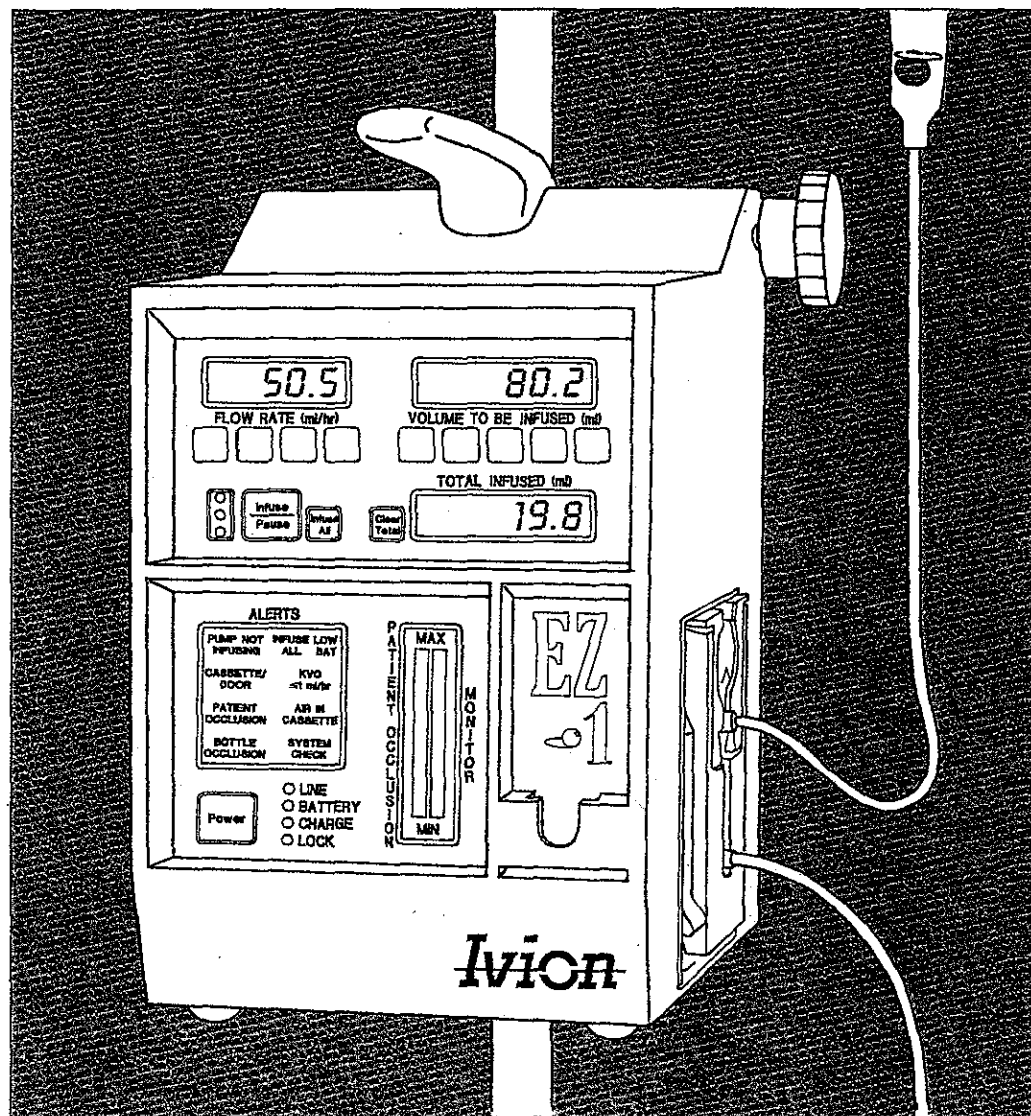
EZ-1™

Volumetric Infusion Pump

OPERATION MANUAL

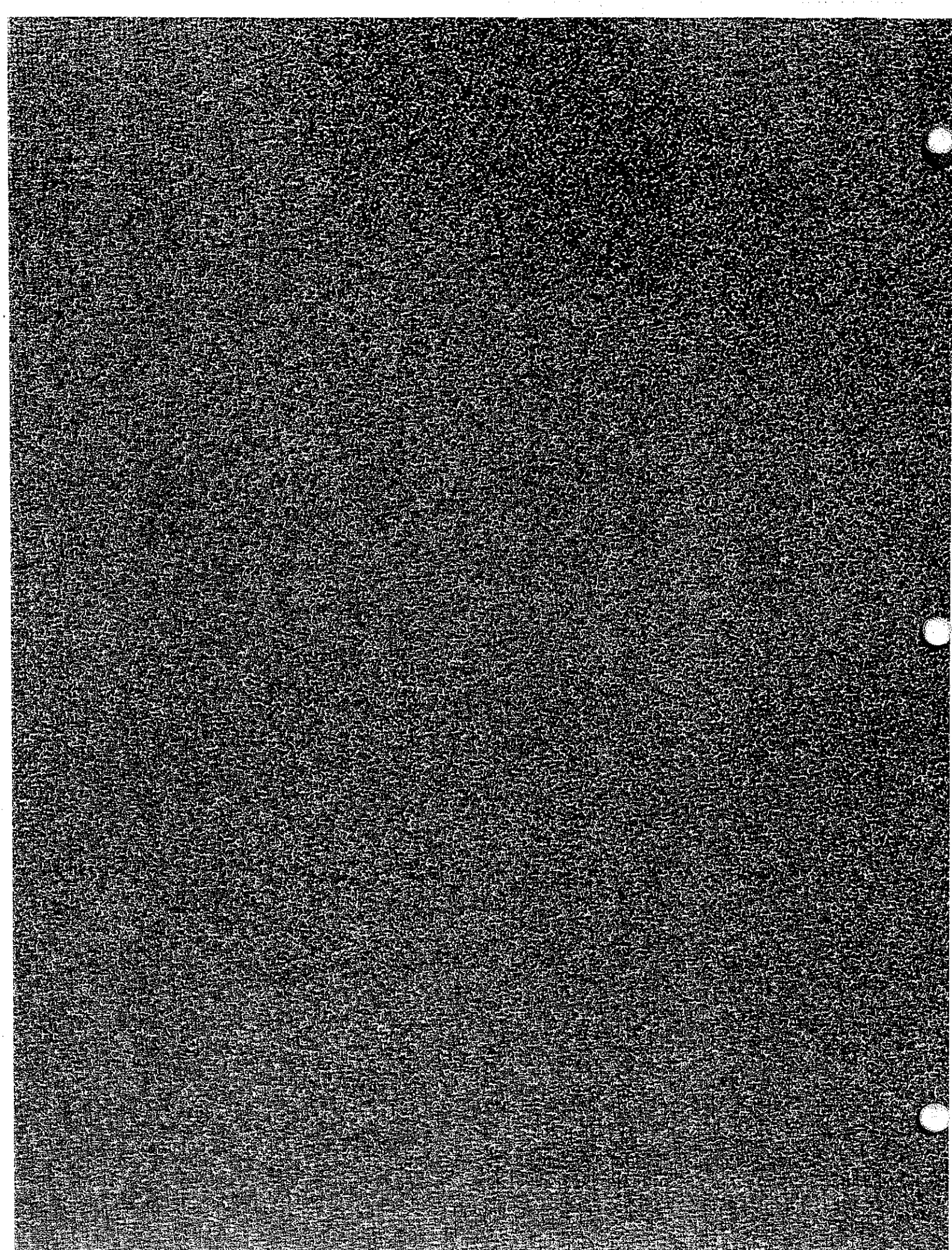
NOTICE: This manual and the equipment it describes are for use by qualified medical professionals only.

TRADEMARK NOTICE: EZ-1™ Volumetric Infusion Pump and Blue Ball™ Valve are trademarks of Ivion Corporation.



INTENDED USE: This manual is not intended to be used with EZ-1 Volumetric Infusion Pumps with serial numbers followed by the code "#607". For pumps with this code, use the EZ-1 Pump Operation Manual part number 945-105-070.

Ivion Corporation
8925 East Nichols Ave.
Englewood, CO 80112
303/799-3688
800/624-8466
FAX: 303/799-3691



How to Use this Manual

Introduction

This *Operation Manual* for the Ivion EZ-1™ Volumetric Infusion Pump is intended for use only by qualified medical professionals. It is divided into 3 sections: "Description", "Operation Instructions" and "Troubleshooting". The following chart summarizes the information you will find in each of the 3 sections:

Section 1: Description

- Illustrations of Pump Features/Controls/Indicator Signals
- Illustration of a Typical Ivion Disposable I.V. Set
- Technical Specifications

Section 2: Operation Instructions

- Warnings and Precautions
- Mounting the Pump on the I.V. Pole
- Preparing the I.V. Set
- Loading the Cassette into the Pump
- Setting Up and Starting the Pump
- Reading the Patient Occlusion Monitor
- Changing the Pump Settings
- When the Infusion is Complete
- Removing the Cassette from the Pump
- When Using Piggyback Administration
- When Using Gravity-Flow Administration
- Battery Operation

Section 3: Troubleshooting

- Alert Conditions
- Cleaning and Care

Maintenance, testing and servicing of the EZ-1 Volumetric Infusion Pump should be referred to qualified service personnel in the institution's biomedical engineering department. Ivion Corporation publishes a *EZ-1 Pump Service Manual* for use by qualified service personnel. Ivion Corporation provides a separate Warranty document for the pump at the time of sale.

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Section 2: Operation Instructions

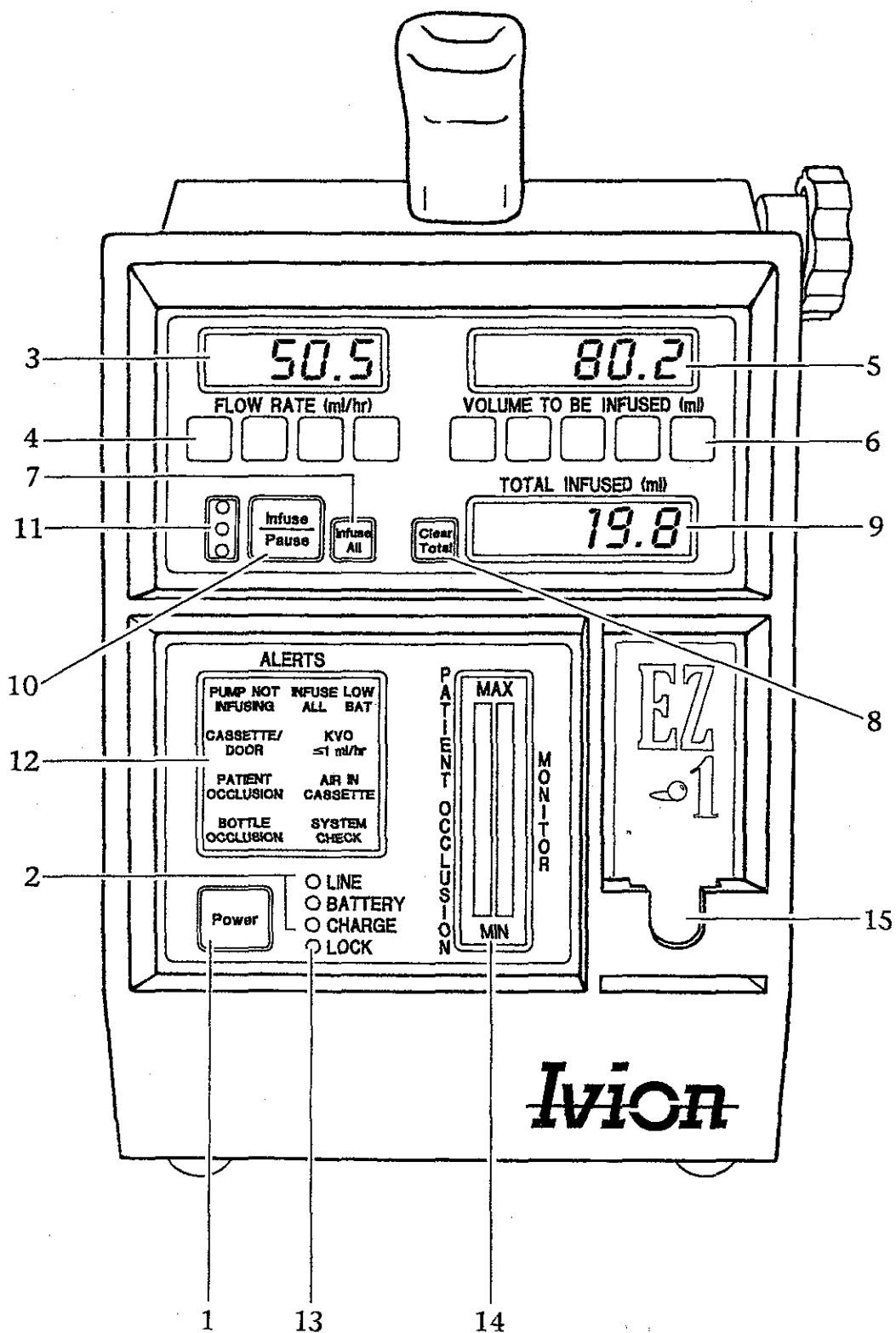
Section 3: Troubleshooting

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Section 1: **Description**

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Chapter 1:
Pump Controls
and Indicators



Front Panel:

1 Power Button.

Press to bring pump into service. Pressing this button a second time takes pump out of service. When pump is turned on, the FLOW RATE, VOLUME TO BE INFUSED, and TOTAL INFUSED displays are illuminated. When pump is turned off, FLOW RATE, VOLUME TO BE INFUSED and TOTAL INFUSED numbers are stored in pump memory for up to 2 hours.

2 Power Status Indicator Lights.

Three lights indicate power status of pump. When green LINE and amber CHARGE lights are on: pump is turned on and connected to an AC power source. When amber CHARGE light is on: pump is turned off and connected to AC power, and pump batteries are charging. When green BATTERY light is on: pump is operating on battery power.

3 FLOW RATE Display.

Shows infusion rate (in ml/hr) set for pump.

4 FLOW RATE Buttons.

Four buttons. Each button changes FLOW RATE display digit immediately above it. To increase display digit by one, touch button and release. To advance display automatically, press button continuously.

5 VOLUME TO BE INFUSED Display.

Shows volume of fluid (in ml) which remains to be infused. Display counts down in 0.1 ml increments. When it reaches 0.0, programmed infusion is complete, and pump reverts to KVO flow rate. If infusion rate is less than 1 ml/hr, then KVO rate equals pre-set infusion rate. If display is left blank (no digits displayed), pump will infuse continuously at programmed rate.

Pressing *Infuse All* button blanks VOLUME TO BE INFUSED display and turns amber INFUSE ALL alert light on.

6 VOLUME TO BE INFUSED Buttons.

Four buttons. Each button changes VOLUME TO BE INFUSED display digit immediately above it. To increase display digit by one, touch button and release. To advance display automatically, press button continuously.

7 Infuse All Button.

Press to activate pump's INFUSE ALL mode. When INFUSE ALL mode is activated, pump infuses continuously at programmed rate until fluid container empties and red BOTTLE OCCLUSION alert occurs.

Pressing *Infuse All* button blanks VOLUME TO BE INFUSED display and turns amber INFUSE ALL alert light on. Pressing *Infuse All* button a second time deactivates INFUSE ALL mode. VOLUME TO BE INFUSED display will illuminate, showing the volume to be infused presently in the pump's memory.

8 Clear Total Button.

Press to set TOTAL INFUSED display to 0.0.

9 TOTAL INFUSED Display.

Displays total fluid volume (in ml) that pump has infused since *Clear Total* button was last pressed (to max. 9999.9).

10 Infuse/Pause Button.

Press to start an infusion or to pause an infusion in progress.

11 Infusing Indicator Lights.

Green lights in a vertical row illuminate sequentially when pump is infusing fluid. If pump is turned on but not infusing fluid, these lights will be off and red PUMP NOT INFUSING alert will be on.

12 Alert Display Panel.

Displays 9 possible pump alert conditions. Red Alert conditions (indicated by red Alert light) will stop pump infusion. Amber Alert conditions (indicated by amber Alert light) allow infusion to continue. All Alert conditions (except INFUSE ALL) are also indicated by an audible chime tone.

Note: For a complete description of Alert conditions, see Chapter 16, "Alert Conditions," in this *Operation Manual*.

13 LOCK Indicator Light.

Indicates that FRONT PANEL LOCKOUT switch has been used to disable push-button controls on front control panel.

14 Patient Occlusion Monitor.

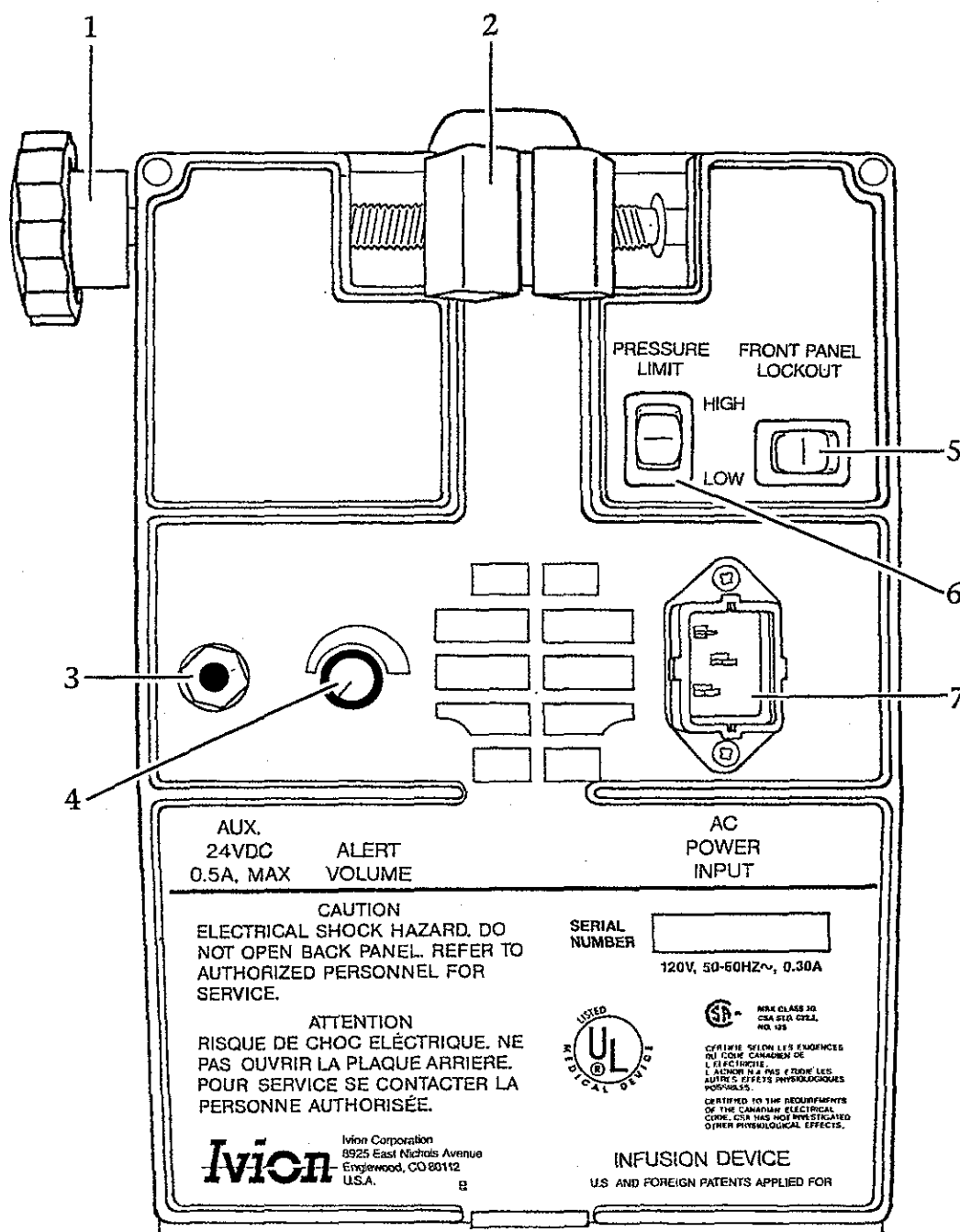
Displays the initial pressure that was automatically measured by the pump when the infusion started (lower amber light) and a pre-set upper limit (upper amber light) that was selected using the pump PRESSURE LIMIT switch. By observing the position of the green light bar between the 2 amber lights, you can note changes in the line pressure. Line pressures falling below the initial pressure or rising significantly above it, indicate possible conditions requiring corrective action.

15 Fill-Aid Bracket.

Designed to hold I.V. cassette vertically so that I.V. set can be primed.

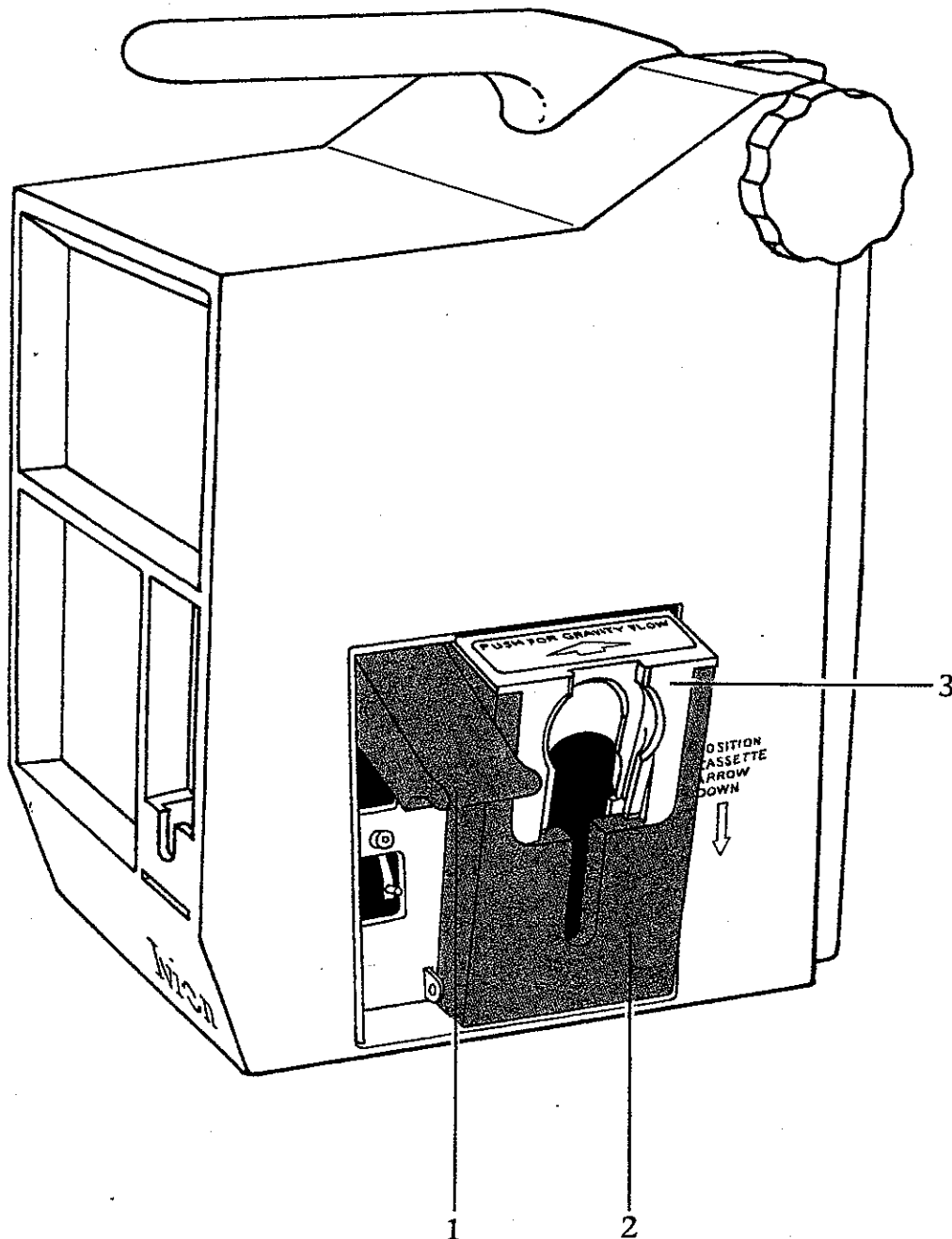
Back Panel:

- 1 Clamp Knob.
- 2 I.V. Pole Clamp.
- 3 Nurse Call Jack.
Enables connection to transmit pump alert signals to remote nursing station. Labeled as *AUX.* 24VDC 0.5A, MAX on pump rear panel.
- 4 **ALERT VOLUME Control Dial.**
Use to control loudness of audible chime tone. To increase chime volume: turn dial clockwise. To decrease chime volume: turn dial counterclockwise.
- 5 **FRONT PANEL LOCKOUT Switch.**
Use to disable front panel push-button controls so that they cannot be actuated. When red LOCK light on front panel is on, front panel controls are disabled. Any Red Alert condition will automatically deactivate LOCK-OUT mode.
- 6 **PRESSURE LIMIT Switch.**
Use to set patient line upper pressure limit (upper amber light) on Patient Occlusion Monitor. Red PATIENT OCCLUSION alert occurs when line operating pressure (green light bar) reaches upper pressure limit. Select HIGH or LOW.
- 7 **AC POWER INPUT Receptacle.**



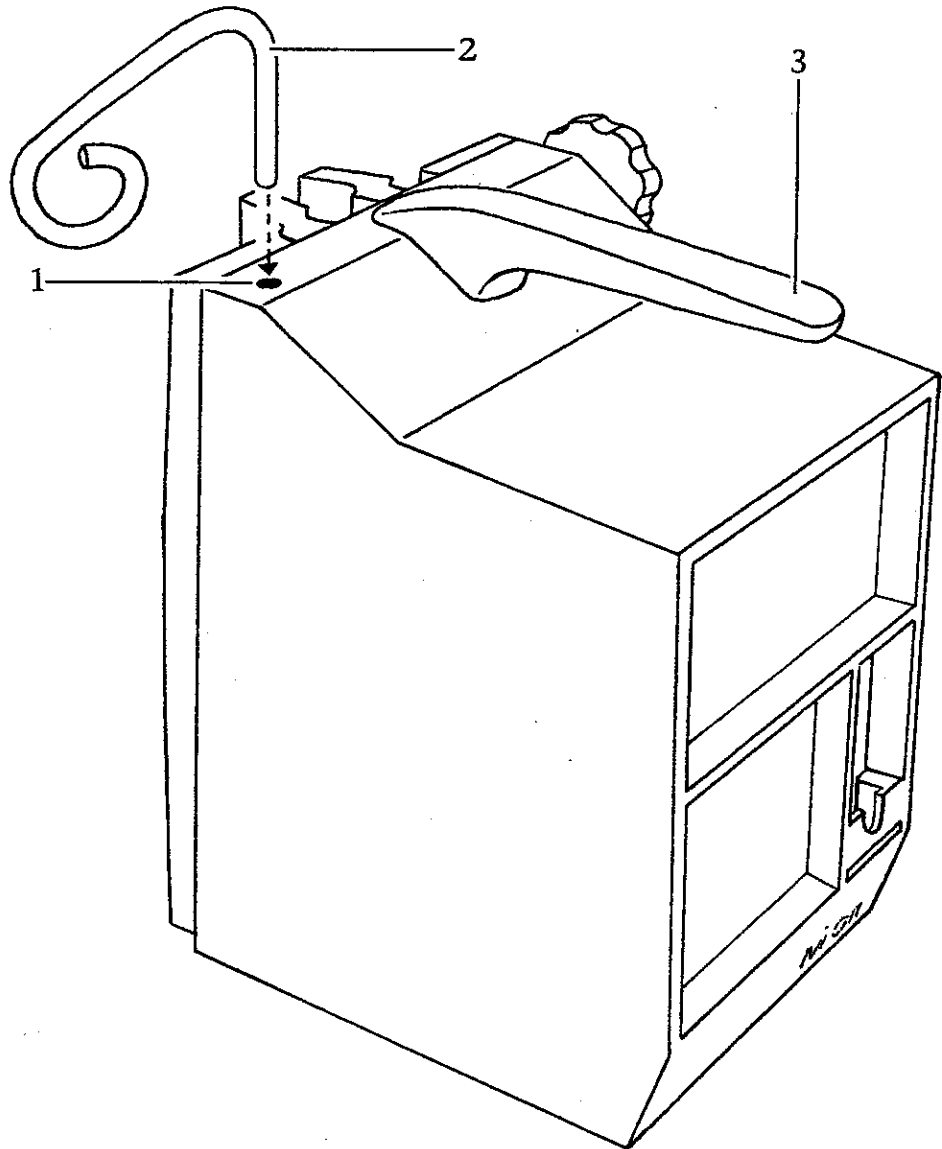
Pump Cassette Door:

- 1 Latch Handle.**
Opens and closes cassette door.
- 2 Cassette Door.**
Disposable administration set cassette is inserted here.
- 3 Guide Plate.**
Positions and locks cassette into place in cassette door. Prevents gravity-flow of fluid into patient line when cassette is locked into place and guide plate is fully forward.



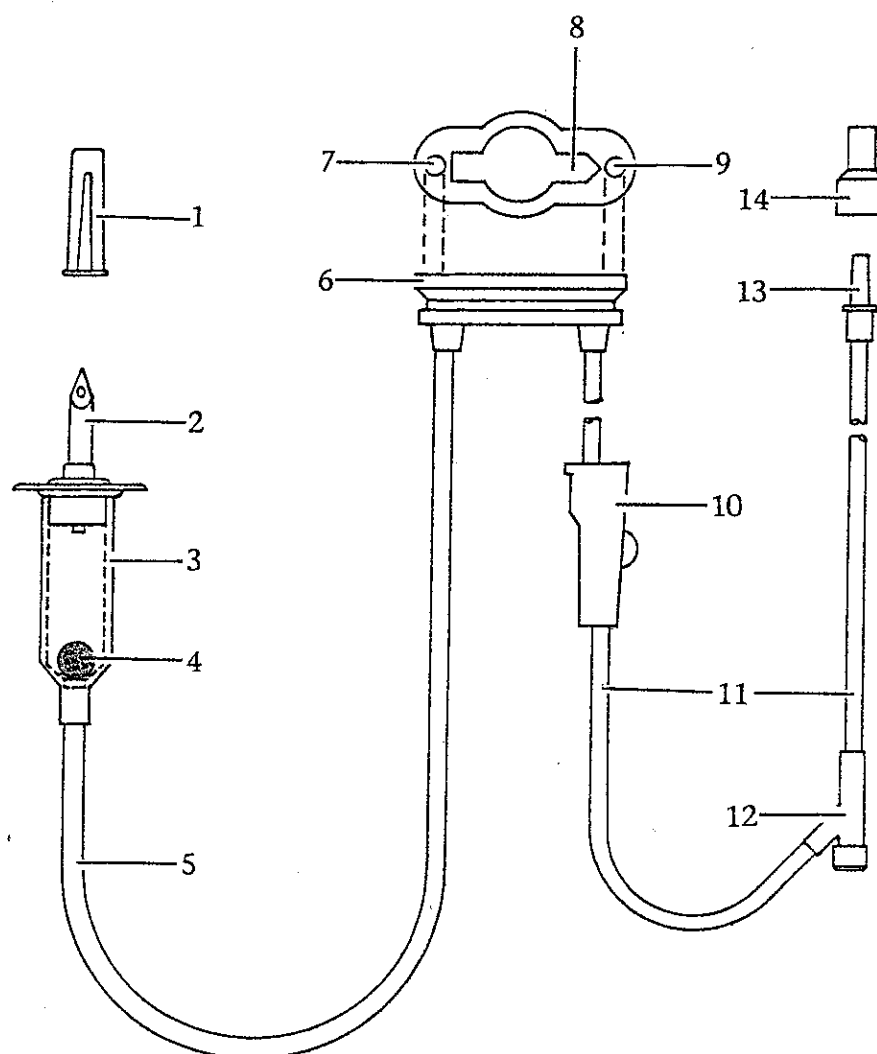
Pump Top:

- 1 **Solution Container Hanger Socket.**
- 2 **Solution Container Hanger.**
Use to suspend an I.V. solution container if desired during transport or when multiple pumps are stacked on a pole.
- 3 **Pump Carrying Handle.**



Chapter 2:
Typical Ivion
Disposable
I.V. Set

1. Protective Cap
2. Fluid Container Spike
3. Drip Chamber
4. Blue Ball™ Valve
5. Bottle Side Line
6. Cassette
7. Cassette Inlet Port
8. Cassette Positioning Arrow
9. Cassette Outlet Port
10. Patient-Side Clamp
11. Patient-Side Line
12. "Y" Injection Site
13. Patient-Side Connector (Luer Taper)
14. Protective Cap



Chapter 3: Technical Specifications

Flow Rate Range:	0.1 to 999.9 ml/hr (in 0.1 ml/hr increments).
Volume to be Infused Counter Range: (programmed infusions)	0.1 to 9999.9 ml (in 0.1 ml increments).
Total Infused Counter Range:	0.1 to 9999.9 ml (in 0.1 ml increments).
Volumetric Accuracy:	± 2%, under standard conditions as defined in EZ-1 Pump Service Manual, Section 6.0.
Fluid Delivery Profile:	Uniform across flow rate range. Pumping increments: approx. 0.7 microliter (1400 divisions per ml). Refill time: approx. 0.25 sec.
Maximum Pressure:	15 psi
Patient Occlusion Alert Pressure:	Switch-adjustable on pump rear panel: HIGH: approx. 8 psig above flow requirements. LOW: approx. 4 psig above flow requirements.
Patient Occlusion Monitor Display:	Bar graph indicates patient line pressure, patient occlusion alert level and start-of-infusion reference level.
Battery:	Rechargeable nickel-cadmium.
Battery Operating Time:	New batteries: 6 hours typical to dead battery from full charge.
Battery Recharge Time:	24 hours (from dead battery to full charge).
Power:	117 VAC nominal, 0.30 Amp, 60 Hz.
Fuse:	0.40 Amp slow blow.
AC Line Leakage:	Less than 100 microamperes. (Complies with UL544, Para. 27.4)
Size (H x W x D):	10.5" x 6.75" x 7.1" (27 x 17 x 18 cm)
Weight:	11 lbs. (5 kg)

Section 2: Operation Instructions

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Chapter 4: Warnings and Precautions

Warnings:

DANGER: Do not use in the presence of flammable anesthetics. The EZ-1 Pump presents a possible explosion hazard if used in the presence of flammable anesthetics.

Precautions:

- The intravenous (I.V.) administration set acts as a gravity-flow set when it is outside the pump or when the guide plate in the pump cassette door is pushed back. Always close the patient-side clamp on the I.V. set before opening the pump cassette door. Whenever loading the cassette into the pump, follow the instructions given in Chapter 7 of this *Operation Manual*.
- A fraction of a milliliter of fluid is expelled into the patient-side line each time the pump cassette door is closed. To avoid this situation, disconnect the I.V. line from the patient prior to closing the pump cassette door, or follow the instructions given in Chapter 7 of this *Operation Manual*.
- Hazardous voltages are present inside the pump. Do not remove the pump rear panel. Service requiring removal of the pump rear panel should be performed only by qualified personnel.
- This electronic device is equipped with a hospital-grade plug. Grounding reliability can only be achieved when the equipment is connected to an equivalent receptacle marked "Hospital Grade".
- Sterilizing by gas or steam autoclaving will damage the pump.

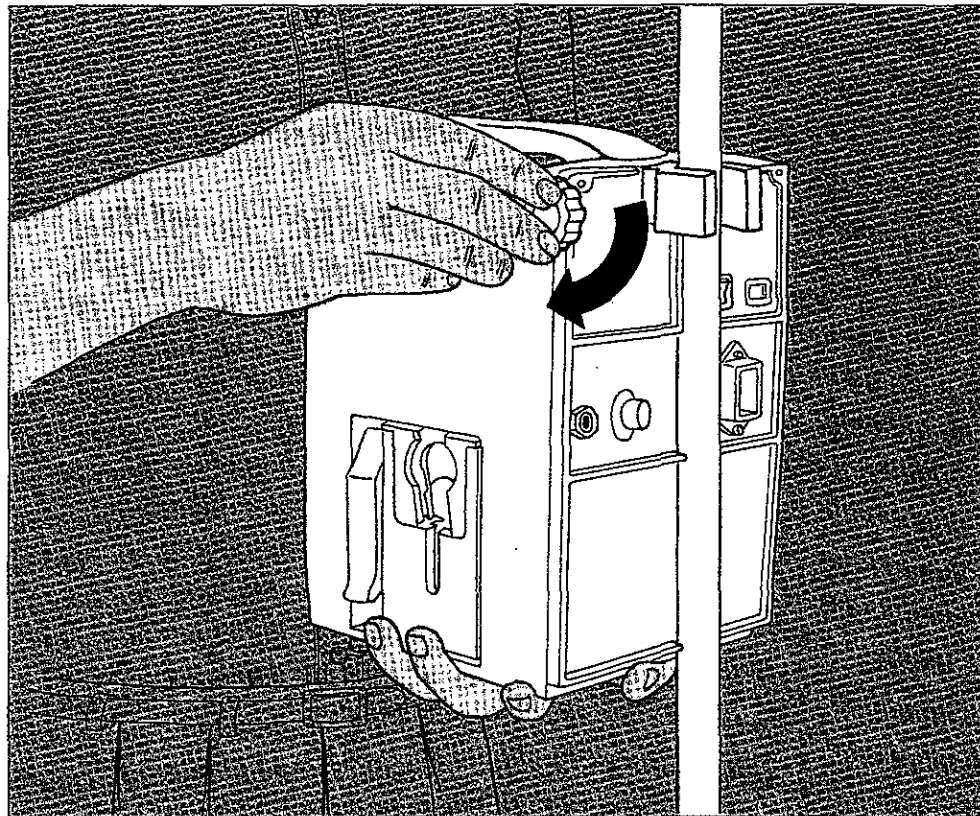
Caution:

Federal (USA) law restricts this device to sale by, or on the order of, a physician.

Chapter 5: Mounting the Pump on the I.V. Pole

■ **Note:** The pole clamp is designed to attach the pump to standard I.V. poles, **not** to skyhooks (ceiling-mounted poles) or non-round poles. Care should be taken to avoid leaning on the pump handle or applying undue weight on it.

■ **Note:** The pump is equipped with rubber feet, so that it may be placed on a flat surface in lieu of mounting it on an I.V. pole.



1. Place the pump against the I.V. pole so that the pole is between the jaws of the pole clamp. Make sure that the pump is centered and straight on the pole, and that the pump back is firmly positioned against it.

To open the clamp jaws, turn the clamp knob counterclockwise.

2. Tighten the pole clamp jaws by turning the clamp knob in a clockwise direction.

While tightening the jaws, support the weight of the pump until the jaws of the clamp are fully tightened. If you do not support the weight of the pump while the jaws are partially tightened, it will be difficult to tighten them fully for secure attachment to the pole. You may wrongly assume at such point that the pump is secure when in fact the jaws may be loose enough to allow sudden sliding.

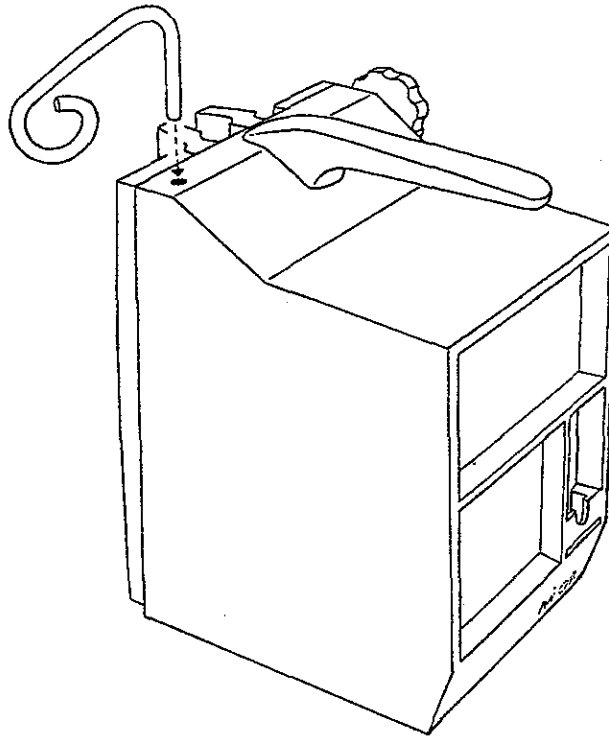
3. Periodically check and re-tighten the pole clamp jaws.

■ **Note:** *It is important that the pole clamp be properly maintained to tighten properly. Be sure that the rubber on the jaws is securely attached to the clamp. Also check that the clamp mechanism operates smoothly with no binding. If binding does occur, return the pump to your service department for maintenance.*

4. When removing the pump from the pole, completely loosen the pole clamp jaws to avoid damage to the clamp mechanism.

To open the clamp jaws, turn the clamp knob counterclockwise.

5. If desired, mount the pump's own I.V. solution hanger by inserting the hanger end into the socket on the top surface of the pump.



You are now ready to prepare the disposable I.V. administration set for use with the pump. Go to Chapter 6, "Preparing the I.V. Set," in this *Operation Manual*.

Chapter 6: **Preparing the I.V. Set**

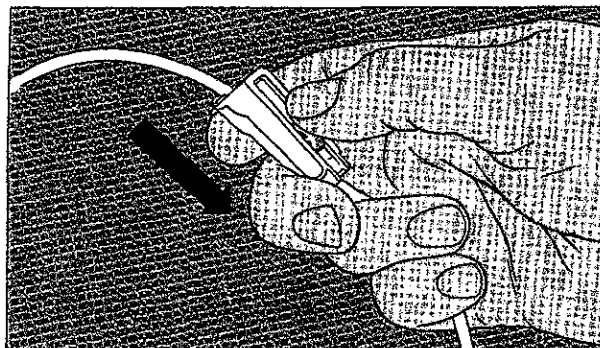
■ **Note:**

This procedure is provided for general guidance when you are using a typical Ivion disposable I.V. administration set. For specific guidance, consult the use instructions packaged with the particular I.V. set you are using.

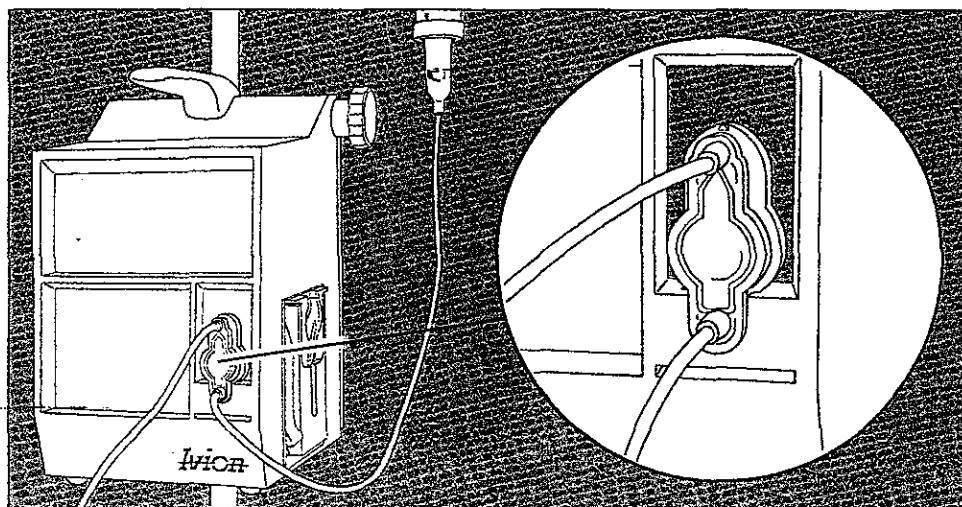
- For procedure using piggyback administration, go to Chapter 13, page 32, in this *Operation Manual*.
- For procedure using gravity-flow administration, go to Chapter 14, page 34, in this *Operation Manual*.

▼ **Caution:** Use standard aseptic technique when preparing the disposable I.V. administration set for use with the pump.

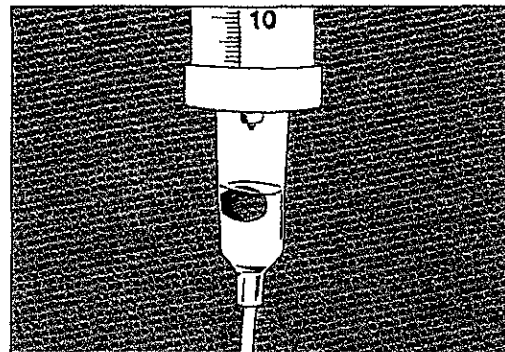
1. Close the patient-side clamp on the I.V. set.



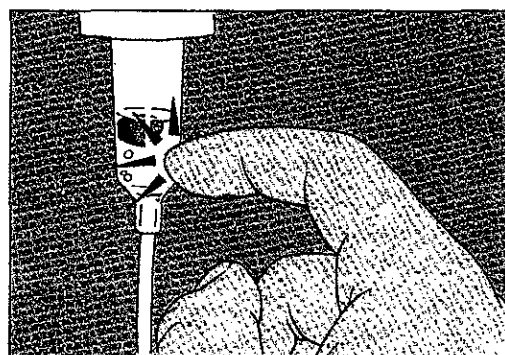
2. Insert the set spike into the solution container.
3. Hang the solution container.
4. Place the I.V. set cassette into the fill-aid bracket of the pump. Insert the cassette into the bracket with cassette arrow pointing up.



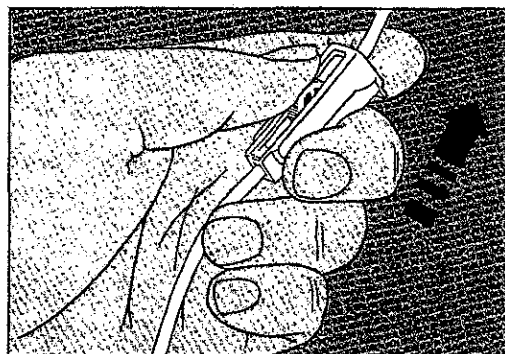
5. Squeeze and release the I.V. set drip chamber until it is partially filled with fluid. If the drip chamber contains an Ivion Blue Ball valve, float the ball by tapping or squeezing the base of the drip chamber.



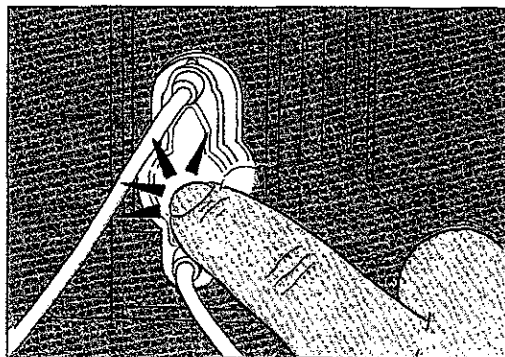
6. Tap the drip chamber to dislodge air bubbles.



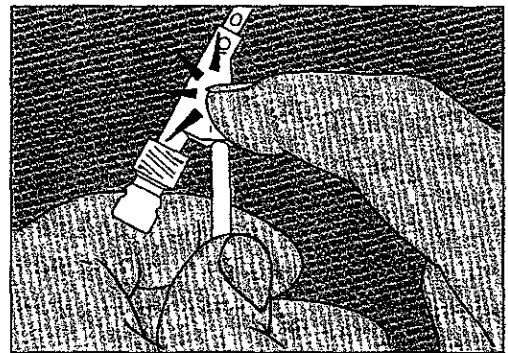
7. Gradually open the patient-side clamp. Allow the fluid to fill the line and the cassette.



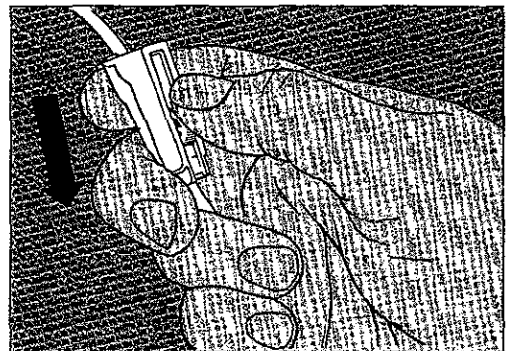
8. Examine the cassette for air bubbles. Remove any air bubbles by tapping the cassette as the fluid is flowing through it. The bubbles will dislodge and flow out of the patient-side line.



9. Continue priming the line. Tap all set components to eliminate air bubbles.



10. After priming the set, close the patient-side clamp to prevent uncontrolled gravity flow.

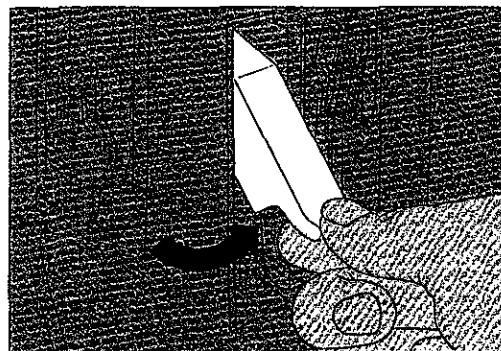


You are now ready to load the cassette into the pump. Go to Chapter 7, "Loading the Cassette into the Pump," in this *Operation Manual*.

Chapter 7: Loading the Cassette Into the Pump

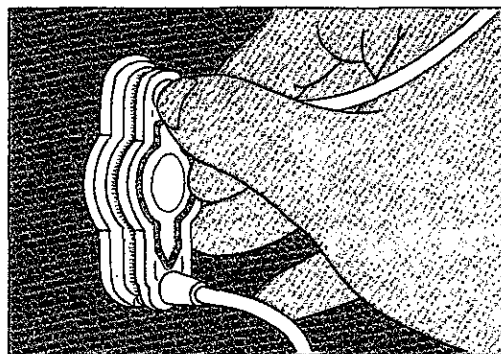
▼ **Caution:** After priming the I.V. set, close the patient-side clamp to prevent uncontrolled gravity flow.

1. Open the pump cassette door by pulling up the cassette door handle.



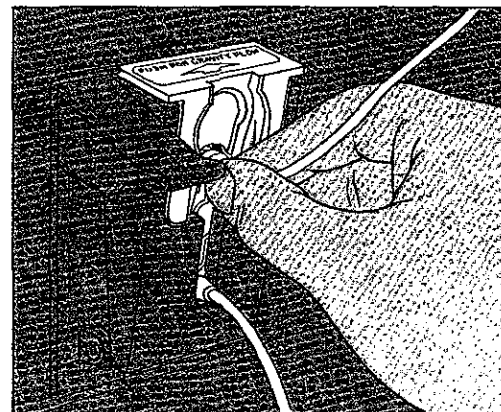
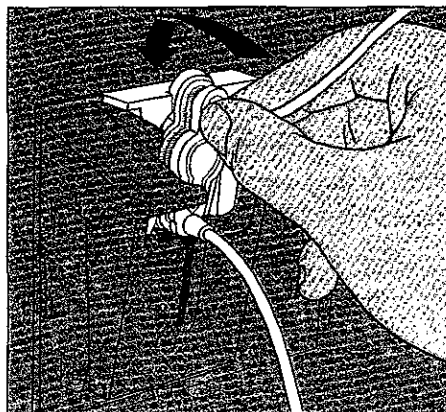
2. Remove the cassette from the pump fill-aid bracket. Grasp the cassette at the bottle-side tubing connection and hold it with the cassette arrow pointing down.

Make sure all air has been removed from the cassette.



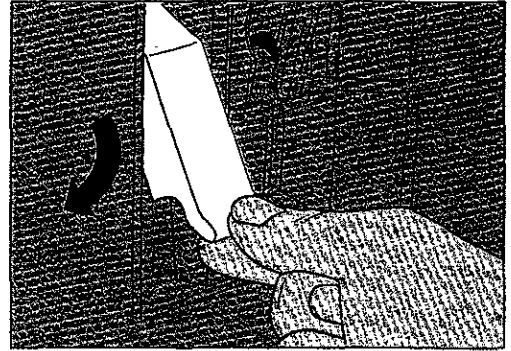
3. Insert the cassette into the cassette door by pushing the cassette straight back against the guide plate, and then down into the slot until the guide plate springs forward.

Check that the cassette is properly locked in the door and the guide plate is sprung fully forward, as shown below right.



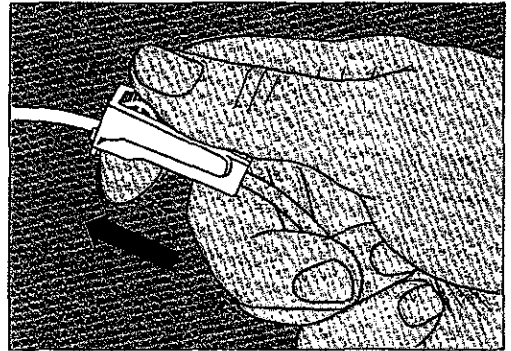
4. Close the pump cassette door by pressing down the cassette door handle.

▼ **Caution:** A fraction of a milliliter of fluid is expelled into the patient-side line each time the pump cassette door is closed.



5. Open the patient-side clamp on the I.V. set.

▼ **Caution:** The I.V. administration set acts as a gravity-flow set when outside the pump or when the cassette door guide plate is pushed back. Always close the patient-side clamp before opening the cassette door.



6. Perform venipuncture and patient connection to the I.V. set, following your institution's standard procedure.

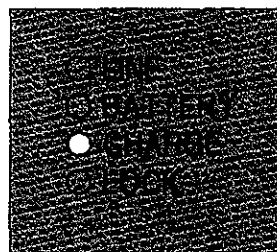
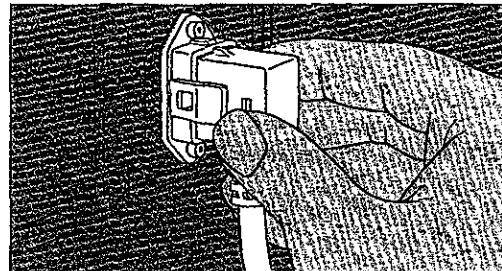
You are now ready to set up the pump for infusion. Go to Chapter 8, "Setting Up and Starting The Pump," in this *Operation Manual*.

Chapter 8: Setting Up and Starting the Pump

1. Insert the power cord into the AC POWER INPUT receptacle on the pump rear panel. Push the plug into the receptacle until the locking tabs on either side of the plug "click" into place.

The amber CHARGE light will illuminate, indicating that the pump battery is charging from the AC power line.

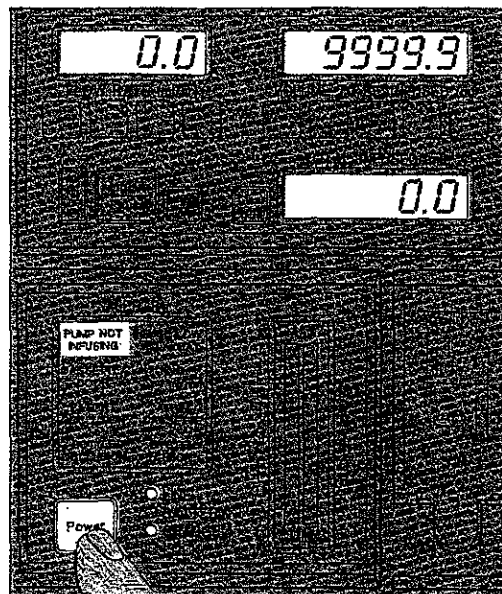
To remove the power cord from the pump, squeeze the locking tabs on either side of the plug and pull.



2. Press the *Power* button to bring the pump into service.

The red PUMP NOT INFUSING alert light will illuminate. If the I.V. set cassette is not loaded in the pump or if the cassette door is open, the red CASSETTE/DOOR alert light will also illuminate.

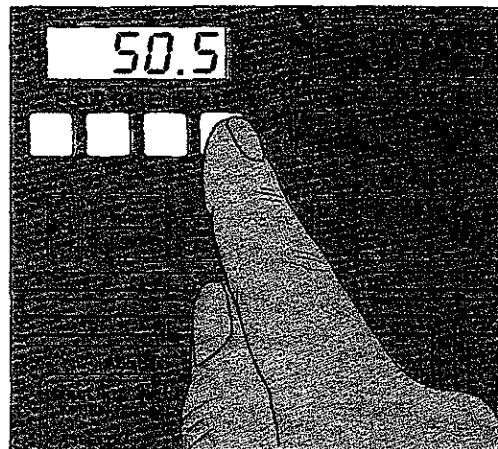
If the pump is being powered on for the first time or if it has not been used within the previous 2 hours, the FLOW RATE display will show 0.0, the VOLUME TO BE INFUSED display will show 9999.9, and the TOTAL INFUSED display will show 0.0. If the pump has been used within the previous 2 hours, these displays will show the settings that were being displayed at the time the pump was last turned off. The pump's internal memory automatically stores the display settings for a period of 2 hours.



When powered on, if the pump is connected to an AC power line, the green LINE light and amber CHARGE light will illuminate. If the pump is operating from its own internal battery pack, the green BATTERY light will illuminate.

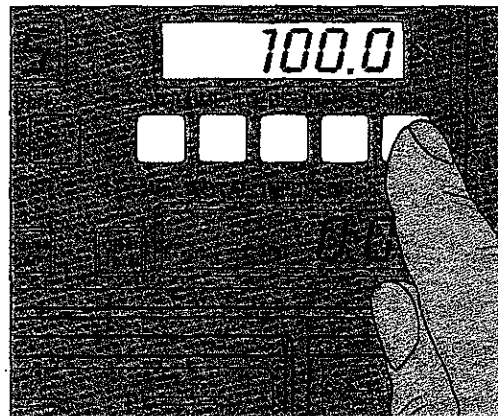
3. Set the FLOW RATE display to the desired rate of infusion (in ml/hr).

There are 4 buttons to use for setting the FLOW RATE display. Each button changes the FLOW RATE display digit immediately above it. To increase the display digit by one, touch the button and release. To advance the display automatically, press the button continuously. The decimal point continuously flashes to highlight the position of the tenths digit.



4. Set the VOLUME TO BE INFUSED display to the desired fluid volume (in ml) to be infused.

There are 5 buttons to use for setting the VOLUME TO BE INFUSED display. Each button changes the VOLUME TO BE INFUSED display digit immediately above it. To increase the display digit by one, touch the button and release. To advance the display automatically, press the button continuously.



- **Note:** If the VOLUME TO BE INFUSED display is blank and the amber INFUSE ALL alert light is illuminated, press the *Infuse All* button to reactivate the VOLUME TO BE INFUSED display.
5. If desired, press the *Clear Total* button to reset the TOTAL INFUSED display to 0.0.

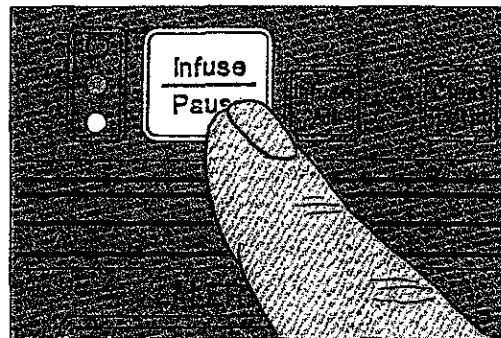
6. Set a HIGH (approx. 8 psi) or LOW (approx. 4 psi) limit on the patient line pressure, using the 2-position PRESSURE LIMIT switch located on the pump back panel. Line pressures reaching this limit above initial line pressure will trigger a PATIENT OCCLUSION alert.

The pressure limit setting is a user-selectable upper limit on the pump's sensitivity to patient line pressure relative to the initial line pressure automatically measured by the pump when infusion starts. If the line pressure reaches the pre-set HIGH or LOW limit, the PATIENT OCCLUSION alert signal will occur. At such time, it is recommended that the I.V. set and venipuncture site be inspected for an occlusion.

- **Note:** The upper line pressure limit (that triggers the PATIENT OCCLUSION alert) is indicated by the upper amber light on the Patient Occlusion Monitor located on the pump front panel. For instructions on how to read the Patient Occlusion Monitor, see Chapter 9 in this *Operation Manual*.

7. Press the *Infuse/Pause* button to start the infusion.

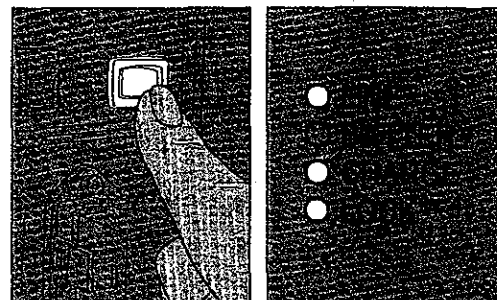
The green lights next to the *Infuse/Pause* button will begin to illuminate sequentially to indicate that the pump is infusing. The lights illuminate in sequence more rapidly at high flow rates and more slowly at low flow rates.



While the pump is infusing, pressing the *Infuse/Pause* button will stop the infusion and illuminate the red PUMP NOT INFUSING alert light. A 2-minute timer is automatically activated when the *Infuse/Pause* button is pressed to interrupt fluid flow. The audible PUMP NOT INFUSING alert signal will occur if the infusion is not restarted within 2 minutes.

- **Note:** Changes in front panel control settings can only be made when the red PUMP NOT INFUSING alert signal is illuminated.

8. To "lock" the pump front control panel against accidental changes during infusion, press the FRONT PANEL LOCKOUT switch on the pump rear panel.



The red LOCK light on the pump front panel indicates that the front panel is "locked" against accidental changes. During lockout, the front panel controls are disabled and cannot be activated.

To deactivate the lockout mode, press the FRONT PANEL LOCKOUT switch. The LOCK light will turn off.

When any Red Alert condition occurs, the lockout mode is automatically deactivated, permitting immediate use of the front panel controls.

For additional instructions, refer to the following chapters of this *Operation Manual*:

- To read the Patient Occlusion Monitor, go to Chapter 9 in this section.
- To change pump settings, go to Chapter 10 in this section.
- For procedure when an alert occurs, go to Chapter 16 in Section 3, "Troubleshooting".
- For description of alert conditions, go to Chapter 16 in Section 3, "Troubleshooting".
- For procedure when the infusion is complete, go to Chapter 11 in this section.
- To remove the cassette from the pump, go to Chapter 12 in this section.

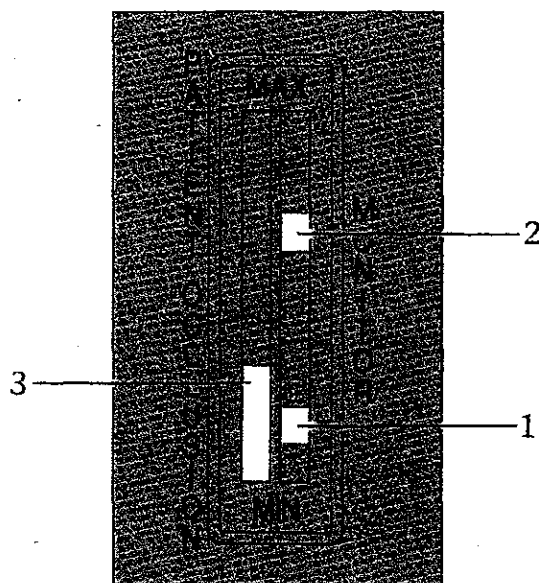
Chapter 9: Reading the Patient Occlusion Monitor

About the Patient Occlusion Monitor

The Patient Occlusion Monitor is designed to detect patient occlusions and provide a visual display of pressure changes in the patient line during infusion. The display is continuously updated because the EZ-1 Pump automatically senses resistance in the patient-side line during infusion.

The Patient Occlusion Monitor displays: (1) the initial pressure that was automatically measured by the pump when the infusion started (lower amber light); and (2) a pre-set upper limit that was selected using the pump PRESSURE LIMIT switch (upper amber light). By observing the position of the green light bar between the 2 amber lights, you can note changes in the line pressure. Line pressures falling below the initial pressure (lower amber light) or rising significantly above it, indicate possible conditions requiring corrective action.

Description of Patient Occlusion Monitor

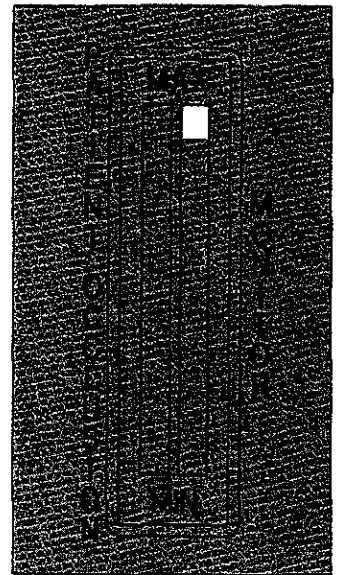


- 1 **Lower amber light.**
Indicates the initial pressure of infusion, as measured automatically by the pump when the infusion starts.
- 2 **Upper amber light.**
Indicates the pre-set upper pressure limit (LOW or HIGH) selected by the clinician using the pump PRESSURE LIMIT switch. Pressures reaching the upper pressure limit will trigger a red PATIENT OCCLUSION alert.
- 3 **Green light bar.**
The height of the vertical bar of green lights indicates the current patient line pressure in relation to the initial pressure (lower amber light) and the upper pressure limit (upper amber light).

How to Read the Patient Occlusion Monitor

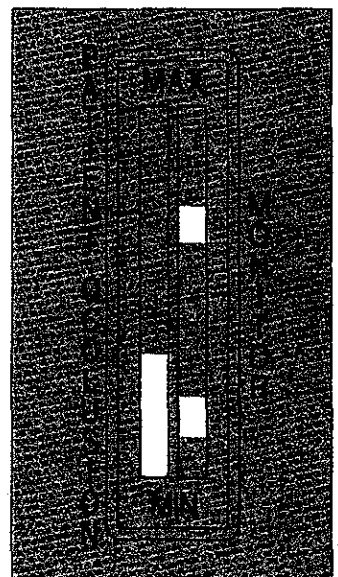
1. When the infusion is started:

- The upper amber light displays at the extreme top of the Patient Occlusion Monitor.
- The lower amber light is not yet displayed.
- The green light bar is not yet displayed.



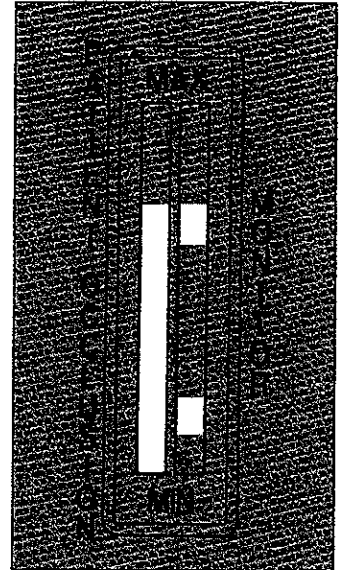
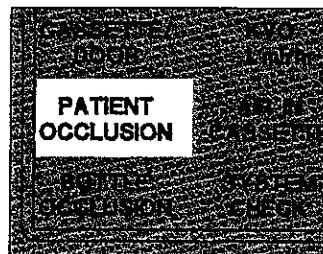
2. When 0.2 to 0.4 milliliters of fluid have been infused:

- The upper amber light displays at a position corresponding to the upper pressure limit selected using the PRESSURE LIMIT switch.
- The lower amber light displays at a position corresponding to the line pressure measured by the pump at the start of infusion.
- The green light bar appears between the 2 amber lights. The position of the top of the light bar indicates the current pressure in the patient line relative to the initial pressure and upper pressure limit.



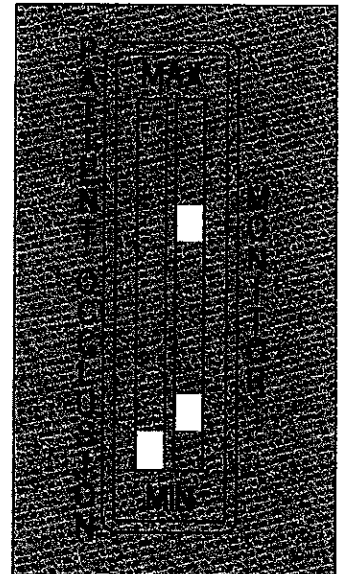
3. If the top of the green light bar moves closer to the upper amber light during infusion, a patient occlusion might be developing. Inspect the I.V. set and venipuncture site.

When the top of the green light bar reaches the upper amber light, a **PATIENT OCCLUSION** alert will occur.



4. If the top of the green light bar falls below the lower amber light, an unusual condition in the I.V. line might be developing, such as an unintentional disconnection.

The green light bar falling below the lower amber light will not itself trigger a pump Alert signal.



Chapter 10: Changing the Pump Settings

1. Press the *Infuse/Pause* button to stop the infusion.

The red PUMP NOT INFUSING alert light will illuminate.

2. Make the desired change. Then press the *Infuse/Pause* button to restart the infusion.

The red PUMP NOT INFUSING light will turn off.

3. If the front panel is locked (indicated by the red LOCK light), the settings cannot be changed. To deactivate the lockout mode and change the settings, press the FRONT PANEL LOCKOUT switch located on the pump rear panel. The red LOCK light will turn off.

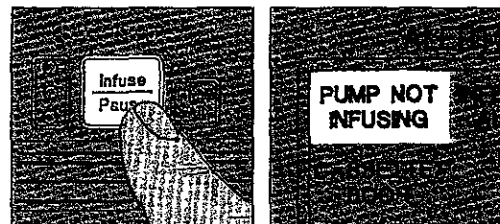
**Chapter 11:
When the
Infusion Is
Complete**

1. If your pump was programmed to infuse a specific volume, using any I.V. set:
 - When the programmed infusion is completed, the pump will automatically switch to infusion at the KVO (Keep Vein Open) rate.
 - The amber $KVO \leq 1 \text{ ml/hr}$ Alert signal will occur.
 - The pump will continue infusing at the KVO rate until you stop the infusion. The amber $KVO \leq 1 \text{ ml/hr}$ Alert signal will also continue until infusion is stopped.
2. If you are using an Ivion Blue Ball set instead of a programmed volume and the *Infuse All* button has been pressed (as indicated by illuminated amber INFUSE ALL alert and blanking of VOLUME TO BE INFUSED display):
 - When the contents of the solution container are emptied, the Blue Ball valve becomes seated in the primary line drip chamber.
 - When the Blue Ball valve is seated in the drip chamber, the red BOTTLE OCCLUSION Alert occurs and the pump stops infusion automatically. The Alert condition continues until the pump is turned off.

Chapter 12: Removing the Cassette From the Pump

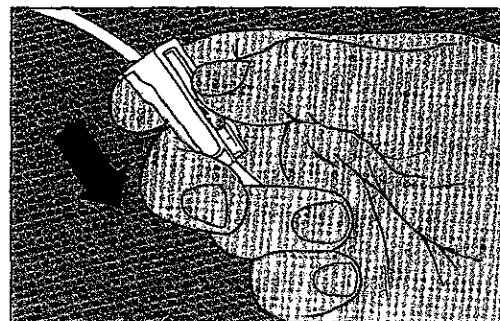
1. Press the *Infuse/Pause* button to stop the infusion.

The red PUMP NOT INFUSING alert light will illuminate.

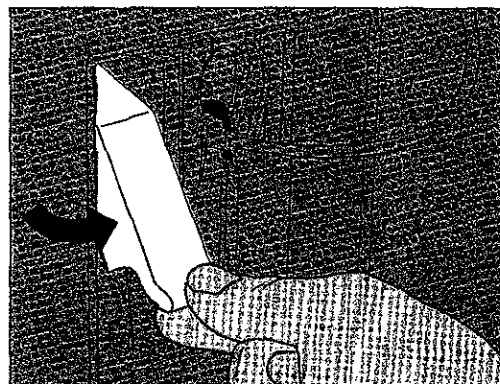


2. Close the patient-side clamp on the I.V. set.

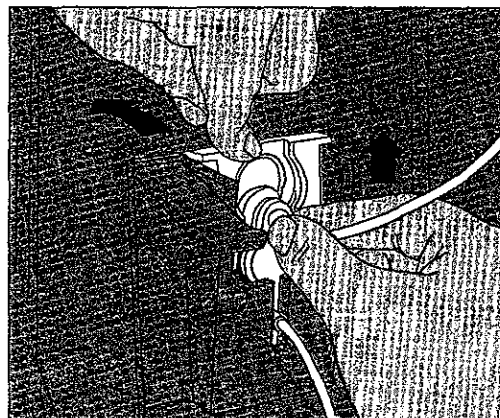
- ▼ **Caution:** The I.V. administration set acts as a gravity-flow set when outside the pump or when the cassette door guide plate is pushed back. Always close the patient-side clamp before opening the cassette door.



3. Open the cassette door by lifting up on the cassette door handle.



4. Push back on the guide plate, grasp the cassette at the top (bottle-side) tubing connection, and remove the cassette from the door.



Chapter 13: When Using Piggyback Administration

■ **Note:** This procedure is provided for general guidance when you are using a typical Ivion disposable I.V. administration set. For specific guidance, consult the use instructions packaged with the particular I.V. set you are using.

▼ **Caution:** Use standard aseptic technique when preparing the disposable I.V. administration set for use with the pump.

1. If the pump is infusing, press the *Infuse/Pause* button to stop the infusion.
2. Prime the secondary set and close the clamp.
3. Connect the secondary solution to the upper "Y" injection site on the primary set (Ivion IV1A03/IV1A08 set).

■ **Note:** The secondary set should not contain an Ivion Blue Ball valve.

4. Close the bottle-side clamp on the primary set and open the clamp on the secondary set. The container head heights do not need to be different.
5. Press the *Infuse All* button on the pump front panel.

The VOLUME TO BE INFUSED display will blank. It is not necessary to program a specific volume for the secondary solution.

6. Set the FLOW RATE display to the desired rate of infusion (in ml/hr) for the secondary solution, if different from the primary solution.

There are 4 buttons to use for setting the FLOW RATE display. Each button changes the FLOW RATE display digit immediately above it. To increase the display digit by one, touch the button and release. To advance the display automatically, press the button continuously.

7. Press the *Infuse/Pause* button to start the infusion.

The green lights next to the *Infuse/Pause* button will begin to illuminate sequentially to indicate that the pump is infusing. The lights illuminate in sequence more rapidly at high flow rates and more slowly at low flow rates.

While the pump is infusing, pressing the *Infuse/Pause* button will stop the infusion and illuminate the red PUMP NOT INFUSING alert light.

8. When the Blue Ball valve has seated in the primary line drip chamber, indicating that the entire secondary solution has been infused, the red BOTTLE OCCLUSION and PUMP NOT INFUSING alert signals will occur. The pump will automatically stop infusing.
9. Close the clamp on the secondary set or remove the secondary container and set, and discard.
10. Open the bottle-side clamp on the primary set.
11. Squeeze the drip chamber to refill it with solution and refloat the Blue Ball valve.
12. Press the *Infuse All* button to reactivate the VOLUME TO BE INFUSED display.
13. Reset the FLOW RATE of the primary solution if different from the secondary flow rate.
14. Press the *Infuse/Pause* button to begin the infusion.

Chapter 14: When Using Gravity-Flow Administration

■ **Note:** This procedure is provided for general guidance when you are using a typical Ivion disposable I.V. administration set. For specific guidance, consult the use instructions packaged with the particular I.V. set you are using.

▼ **Caution:** Use standard aseptic technique when preparing the disposable I.V. administration set for use with the pump.

1. Press the *Infuse/Pause* button to stop the infusion.

2. Close the patient-side clamp of the I.V. set.

3. Remove the cassette from the cassette door.

Follow the procedure given in Chapter 12, "Removing the Cassette from the Pump," in this *Operation Manual*.

4. Adjust the flow rate using the patient-side clamp.

5. Refer to the instruction card packaged with your disposable Ivion I.V. administration set for additional directions.

Chapter 15: Battery Operation

Definitions

- **Operating Time.** The period of time that the pump is operating on battery power until a dead battery occurs.
- **Battery Life.** The number of charge/discharge cycles that the battery will endure before losing its usefulness.
- **Low Battery Alert.** Indicates that the pump should be plugged immediately into an AC power outlet to recharge the batteries.
- **Dead Battery.** Occurs when the circuits in the pump turn the pump off because the battery voltage has decreased below the level necessary to assure proper pump operation.
- **Battery Recharge Time.** The length of time that the pump is plugged into an AC power outlet whether or not the pump is operating. A 24-hour recharge time is recommended to assure full charge from a Dead Battery condition.

General Considerations

The amount of pump operating time achievable from a given set of batteries depends on: (1) the pump operating conditions, (2) the charge condition of the batteries, and (3) the history of use throughout the life of the batteries.

Operating Time Considerations

New batteries will typically provide an Operating Time of 6 hours from a full charge. The Operating Time will decrease over a number of months. Batteries are expendable components which require periodic replacement by qualified service personnel.

Environmental Conditions Affecting Battery Operation

The batteries can be adversely affected by extremes in temperature. Operating the pump outside the range of 65° to 85° F can reduce battery Operating Time. Storage of the pump at temperatures greater than 90° F can reduce battery life.

To Charge the Battery

Plug the pump power cord into an AC power outlet.

- The amber CHARGE light on the front panel indicates that the pump battery is charging.
- A 24-hour recharge time is recommended to assure full charge from a Dead Battery condition.
- The EZ-1 Pump can be operated while it is being charged.

Battery Operation for Critical Applications

When the loss of pump battery power would be critical to patient care (e.g., when transporting a patient in a vehicle not equipped with AC power) the following procedure is recommended:

1. Charge 2 EZ-1 Pumps for 24 hours or more to assure full battery charge.
2. Use one pump for the critical application and carry the second pump as a back-up unit.

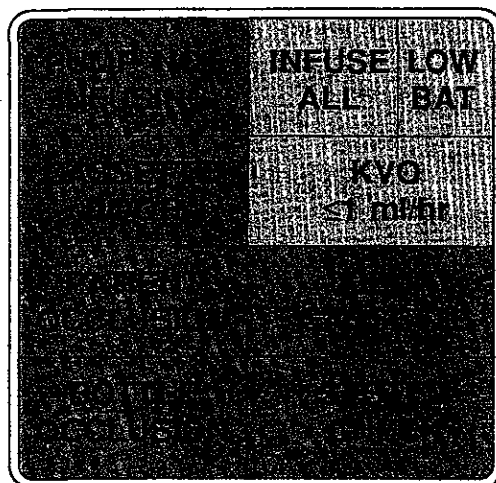
Section 3: **Troubleshooting**

<i>Chapter</i>	<i>Page</i>
16 Alert Conditions	38
17 Cleaning and Care	43

Chapter 16: Alert Conditions

Summary of Alert Conditions

- **Red Alert Conditions.** Mean that the pump has stopped infusing fluid. Indicated by red warning light and audible chime tone.
 1. PUMP NOT INFUSING
 2. CASSETTE/DOOR
 3. PATIENT OCCLUSION
 4. BOTTLE OCCLUSION
 5. AIR IN CASSETTE
 6. SYSTEM CHECK
- **Amber Alert Conditions.** Mean that the pump is still capable of infusing fluid. Indicated by amber warning light and audible chime tone.
 1. INFUSE ALL
 2. LOW BAT (flashing amber)
 3. $KVO \leq 1 \text{ ml/hr}$
- **Note:** If both red and amber Alert signals are present, the pump is not infusing fluid.



- - Red Alert Conditions
- - Amber Alert Conditions

If an Alert Signal Occurs

1. A red Alert condition automatically stops the infusion.
- **Note:** Amber Alert conditions do not stop the infusion. Before taking corrective action, press the *Infuse/Pause* button to stop infusion.
2. Read the Alert message on the pump front panel and take corrective action.
3. Press the *Infuse/Pause* button to restart the infusion.
4. Reset the FRONT PANEL LOCKOUT mode if desired.

The FRONT PANEL LOCKOUT mode is automatically deactivated when a red Alert signal occurs.

<i>Alert</i>	<i>Cause</i>	<i>Corrective Action</i>
PUMP NOT INFUSING (Red)	● Normal condition whenever pump brought into service with <i>Power</i> button.	Set up pump and begin infusion.
	● Accompanies all red Alert conditions	Correct Alert condition. Press <i>Infuse/Pause</i> to begin infusion.
CASSETTE/DOOR (Red)	● Cassette door open.	Close cassette door.
	● Cassette door closed, but no cassette present.	Prime cassette, insert in cassette door slot, close door.
PATIENT OCCLUSION (Red)	● Patient-side clamp closed.	Open patient-side clamp.
	● Blocked or kinked patient-side tubing.	Check and clear patient-side tubing.
	● Blockage in filter, attached appliances or infusion site.	Check filters, appliance and infusion site.
BOTTLE OCCLUSION (Red)	● Blue Ball valve has seated as the I.V. drip chamber empties.	Refill drip chamber and squeeze base of drip chamber to float ball.
	● Restriction between the fluid container and pump cassette.	Remove restriction between solution container and pump cassette.
	● Closed bottle-side clamp.	Open bottle-side clamp.
	● Inadequate venting of air into fluid container.	Provide proper air venting for I.V. container.
	● Closed burette air vent.	Open burette air vent.

<i>Alert</i>	<i>Cause</i>	<i>Corrective Action</i>
AIR IN CASSETTE (Red)	● Air trapped in cassette.	Reprime I.V. set to remove air.
	● Empty container when using I.V. set without Blue Ball valve.	1. Replace I.V. container. 2. Reprime I. V. set.
INFUSE ALL (Amber)	● VOLUME TO BE INFUSED (programmed infusion feature) not in use. Pump will not revert to KVO rate, but will pump at the programmed rate.	Press <i>Infuse All</i> to regain programmed infusion feature.
	■ Note: Pump must be in PUMP NOT INFUSING mode to turn INFUSE ALL on or off.	
LOW BAT (Flashing Amber)	● Battery requires charging.	Immediately connect pump to AC power. (Refer to Chapter 15, "Battery Operation," in this <i>Operation Manual</i> .)
KVO ≤ 1 ml/hr (Amber)	● Programmed infusion complete. Infusion continues at 1 ml/hr if FLOW RATE is set greater than or equal to 1 ml/hr. Infusion continues at FLOW RATE, if FLOW RATE is less than 1 ml/hr.	1. Press <i>Infuse/Pause</i> . 2. Set new VOLUME TO BE INFUSED. 3. Press <i>Infuse/Pause</i> to resume the infusion.

<i>Alert</i>	<i>Cause</i>	<i>Corrective Action</i>
SYSTEM CHECK and PUMP NOT INFUSING (Red)	● Electronic or mechanical malfunction of the pump.	1. Press <i>Power</i> to turn the pump off. 2. Press <i>Power</i> to turn pump on again. 3. Reset FLOW RATE and VOLUME TO BE INFUSED if needed. 4. Press <i>Clear Total</i> and <i>Infuse All</i> as needed. 5. Press <i>Infuse/Pause</i> to resume the infusion.
SYSTEM CHECK* and CASSETTE/DOOR and PUMP NOT INFUSING (Red)	● Transient electrical situation. ● Electronic or mechanical malfunction of the pump.	1. Record FLOW RATE, VOLUME TO BE INFUSED, and TOTAL INFUSED because pump memory will clear. 2. Close patient-side clamp. 3. Open cassette door. 4. Allow display to blank. 5. Pump will turn off. 6. Close cassette door. [**See <i>Caution</i> below.] 7. Open patient-side clamp. 8. Turn the pump on by pressing <i>Power</i>. 9. Re-set appropriate FLOW RATE and VOLUME TO BE INFUSED. 10. Press <i>Infuse All</i> as needed. 11. Press <i>Infuse/Pause</i> to resume the infusion.

*** Note:** SYSTEM CHECK monitors internal electronic functions and is unaffected by bottle height, solution type, or infusion site patency. Manipulation of the I.V. set will not affect the SYSTEM CHECK condition.

If the preceding "Corrective Actions" fail to remedy the Alert condition, note the Alert condition and return the pump to qualified service personnel. It may be helpful to return the I.V. set in use when the Alert condition occurred.

**** Caution:** A fraction of a milliliter of fluid is expelled into the patient-side line each time the pump cassette door is closed.

Chapter 17: Cleaning and Care

- ▼ **Caution:** Sterilizing by gas or steam autoclaving will damage the pump.
- Always disconnect the pump from the AC power source before cleaning.
- Do not immerse the pump in fluid of any kind.
- Do not spray liquid into the interior of the pump.
- Take care to avoid fluid entry into the pump.
- Clean or disinfect the pump using a soft cloth dampened with soapy water or a non-staining chemical disinfectant (consult the housekeeping or infection control department in your facility). **DO NOT** clean the pump using acetone or other plastic solvents.
- Pay particular attention to the rubber membrane and other surfaces of the receptacle inside the cassette door to assure that they are clean and free of foreign material. Failure to clean these components may cause improper pump operation.
- When the pump is not in use, keep the batteries charged by connecting the pump to AC power. Recharge the batteries by connecting to AC power for 24 hours. However, the pump can also be operated while the batteries are charging.
- Perform periodic maintenance and testing of pumps.
(Refer to biomedical engineering department in your facility.)